Guidance for Use of SNOMED CT in Pharmacists' Documentation of Medication-Related Outcomes

September 6, 2018

Pharmacy Health Information Technology Collaborative

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1. PURPOSE

The Patient Protection and Affordable Care Act (PPACA) mandated the establishment of a national strategy for quality improvement in health care (the National Quality Strategy) for increasing access to high-quality and affordable health care. The National Quality Strategy's three broad aims are: 1) better care, 2) healthy people/healthy communities, and 3) affordable care. Development of robust structured codes to capture medication-related outcomes in health IT (information technology) software is an important step in achieving these goals. Standardized, coded, medication-related outcomes that are person-centered, reliably captured, easily shareable with care team members, and reportable for analysis will help guide treatment decisions for patients, providers, and other health care stakeholders, helping identify the most appropriate, safe, and cost-effective care strategies. Careful development of documentation codes for utilization during the patient care process could provide the necessary structure to trigger a paradigm shift in how patient care quality data is developed, extracted, and analyzed.

Pharmacists involved in the delivery of patient care services have long been successful at improving patient outcomes. Numerous publications show pharmacist-provided services have a positive impact on outcomes such as medication adherence, adverse drug events, and care goals. A previous publication titled, Documenting Comprehensive Medication Management in Team-Based Models Using SNOMED CT Codes, explains how pharmacists can use SNOMED CT codes to document medication therapy interventions to resolve medication therapy problems.[1]

This paper is designed to guide pharmacists, other clinicians, vendors, administrators, and other interested parties on how to capture medication-related outcomes data using SNOMED CT and other standardized terminologies for achieving higher quality health care as directed by the PPACA.

2. Overview

Pharmacists play an integral role in identifying, documenting, refining, and influencing medication-related patient outcomes. Pharmacists use a person-centered approach to optimize outcomes. The Pharmacist Patient Care Process, published by the Joint Commission of Pharmacy Practitioners (JCPP),[2] outlines five steps to optimize treatment outcomes: collect, assess, plan, implement, and follow-up.

Pharmacists must collaborate and communicate with others on the care team (including patients, family, and caregivers) and document care appropriately. Complete and accurate documentation that can be shared with all team members is critical for the ongoing care of the patient. Using a standardized format, such as SNOMED CT (Systematized Nomenclature of Medicine – Clinical Terms), to document medication-related outcomes could benefit care in many ways, such as by providing a uniform way for a practice to measure patient outcomes, sharing patient specific outcomes electronically with other team members, or using these outcomes to evaluate performance related to clinical quality measures.

In contemporary patient care models, pharmacists focus on establishing care goals, implementing interventions, and monitoring outcomes. Pharmacists share accountability with other health care providers to achieve optimal outcomes. Comprehensive care models drive pharmacists and other care team members to focus on person-centered outcomes rather than narrowly targeting goals associated with specific clinical services or disease states.

Pharmacists should create and maintain longitudinal medication-related care plans. The National Partnership for Women and Families has identified the five key principles as part of the vision for patient-centered shared care planning:[3]

1. *Health and care plans should be goal-oriented, dynamic tools (not static documents).*
2. *Tools that facilitate health and care planning should enable all members of the care team to securely access and contribute information, according to their roles.*
3. *Health and care plans should identify and reflect the ability and readiness of an individual (and caregiver) to successfully meet the individual's goals, as well as potential barriers.*
4. *Health and care planning and tools should facilitate decision-making and specify accountability.*
5. *Every individual would benefit from health and care planning and tools.*

ON DISCHARGE FROM HOSPITAL TO LONG-TERM AND POST-ACUTE CARE SETTING (LTPAC)

Documentation codes transform information typically written or typed as progress notes into discrete data points structured to describe the care provided to an individual patient. Health IT software systems already capture many types of information as discrete data, including diagnoses, medications, and laboratory results. However, much of the information is embedded in free text form, unable to be extracted for reporting and analytics purposes. Using coded terminologies to capture clinical findings, problems, interventions, and outcomes as discrete data points enables providers, payers, patients, and other stakeholders to use the information in new ways.

SNOMED CT is a coding terminology used for clinical documentation and is a federally recognized standard for health information technology in the United States.[4] SNOMED CT codes are standardized terms used to document findings, problems, interventions, and outcomes.[5] Additional coding terminology used in healthcare include LOINC for laboratory results, RxNorm for medications, and CVX for immunizations. These terminologies and their specific codes are used to capture clinical information within electronic record systems. Clinicians (e.g., pharmacists, physicians, nurses) who are utilizing electronic systems to document care do not need to learn each specific code. Software user interfaces allow clinicians to choose the finding (e.g., heart failure) or intervention (e.g., increase dose) when providing patient care, while in the background, the software system automatically logs the corresponding code.

Structured data stored in electronic systems provides the means to measure patient outcomes and quality. For example, every medication therapy problem is represented by a unique SNOMED CT code. When an end-user documents "dose too low" from the user interface, the code 448152000 is logged in the database. This code is stored in a structured way and associated with the specific patient based on their unique medical record number. Additional contextual information may be associated with the code when a status of either "Active" (55561003) or "Resolved" (code pending) is linked to it from the user interface. Since the status is linked to the medication therapy problem, one can understand whether an intervention was implemented to resolve the medication therapy problem or if there needs to be further interventions to resolve the problem.

Structured data can also be used to measure quality of care for an individual patient or across a population. Examples throughout this paper throughout this paper will how this works in practice.

3. OUTCOMES

TYPES OF OUTCOMES

Tracking outcomes may be driven internally by a pharmacist's practice setting or externally by payers (Medicare, Medicaid, commercial) or pharmaceutical manufacturers through outcomes-based contracts. Over the past 20 years, quality measures have been developed and are now formally in use in nearly every health care setting in the U.S. Quality or performance measures are sometimes classified as structure, process, or outcome measures based on what they target. Structural measures may evaluate whether the care provider has an electronic medical record (EMR) in place or if they offer particular services (e.g., stroke care). A process measure evaluates if a provider takes an action that is evidence-based or best practice, such as completing a diagnostic test or ordering a medication. There are different ways to classify outcomes. One simple way of classifying outcomes is the ECHO model (economic, clinical, and humanistic outcomes).[6] Clinical outcomes could be blood pressures within a target range or a decrease in actual cardiovascular events. Humanistic outcomes could be patient satisfaction survey or quality of life assessment results. Economic outcomes are financial endpoints, such as the cost-of-care related to hospitalization.

This paper is focused on outcomes that can be impacted by pharmacists. Examples include:

- Disease state outcomes (condition-specific and patient-specific)
- Medication therapy problem outcomes
- Patient-related outcomes
- Economic outcomes

Outcomes measures can vary in nature, but mortality rates, disease state outcomes, and complications rates (for procedures) are good examples of firm end-points. Some measures are surrogates for an actual outcome, such as Hemoglobin A1C for diabetes or low-density lipoprotein (LDL) for cardiovascular disease. By improving these indicators, we believe the long-term goals (e.g. reduced mortality, slowed disease progression, fewer disease complications, and improved quality of life) are achieved. These outcomes are often referred to as leading and lagging measures based on the time of measurement. Current value-based payment models may use any of these quality endpoints in their required reporting.

PATIENT-SPECIFIC OUTCOMES

Quality measures can assist in assessing how well providers and plans are doing in delivering appropriate, high value care across patient populations. However, there is a growing recognition of the need to ensure care is personalized or customized to the individual patient. Improved patient engagement and use of shared decision making are now expected care delivery strategies. Although patient-specific goals may not always align with standardized quality, the goals should be included in clinical documentation and outcomes related to these goals must be tracked. For example, a patient with COPD may set the goal of being able to climb the stairs in their home without becoming excessively short of breath. The pharmacist managing the patient's COPD medications would document this goal and then note whether or not the goal was achieved based on the patient's input. This can be tracked internally and provide valuable information on care delivery. Looking forward, pharmacists can expect to see more development around patient-reported outcome measures (PROMs), physical, mental, & social health statuses, clinical assessments, patient-reported experience measures (PREMs), and surveys.[7]

QUALITY MEASURES

Many payers and groups have established quality programs to demonstrate the care being de-

livered is high quality and valuable. If a provider contracts with a payer, various requirements will need to be followed, including collecting and submitting data for quality measures on a regular basis. Table 1 provides examples of some of the quality measures that exist in the health care market place. Currently, the majority of quality measures in use are process and surrogate measures, as the industry works to develop dependable outcome measures. It is worth noting that there are thousands of quality measures available for use, and a surprisingly large percentage can be impacted by pharmacists' patient care activities.

CONNECTING OUTCOMES TO CLINICAL DOCUMENTATION

In today's health care environment, it is critical for pharmacists to understand the value and importance of these outcomes and quality measures. SNOMED CT codes support clinical documentation and allow for standardized collection and reporting of data related to quality measures. Moreover, the ability to systematically track and document patient care positions pharmacists to develop new processes to improve quality and new methods to streamline the quality assessment.

4. CASE EXAMPLE

The case example below illustrates how clinical documentation codes can be used by pharmacists within the pharmacists' patient care process to document care and capture specific outcomes. The different types of outcomes listed in the background section will be highlighted.

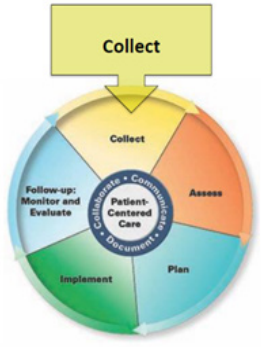
Initial Visit

Background

KD is 58-year-old female who recently established care at a family practice clinic and was seen by her assigned physician four days ago. Although she is compliant with her medications, her physician referred KD for a medication therapy management (MTM) appointment with a pharmacist because of her multiple medications, disease states, and perceived gaps in medication therapy. He directed KD to schedule an appointment through their contracted partner, ABC Pharmacy, which holds a collaborative practice agreement with him.

SNOMED CT CONCEPT	CATEGORY	SNOMED CT ID
Referred by primary care provider	Finding	2021000124102
Taking multiple medications for chronic disease	Finding	432341000124108

Collect



The pharmacist collected multiple pieces of information about KD from her medical records, including medical problem list, current and past treatment regimens, and identified goals from other providers. She performed a limited history and physical, reviewed labs, completed a review of vital signs, and went through a detailed medication history to confirm which medications KD is currently taking, then reconciled and updated the medication list within her patient software.

HEART FAILURE/HYPERTENSION

KD has had hypertension for many years. Several years ago she noted shortness of breath and swelling in her legs; her physician told her she has heart failure. Currently, she is taking enalapril and a "water pill" for her conditions. Lately, she has experienced more shortness of breath and trouble with specific activities, such as cleaning her house and grocery shopping because of her symptoms.

DIABETES

KD was told she had diabetes when she was 50 years old. Her symptoms included frequent urination and always being thirsty. She currently has no complaints, although she knows she does not eat very well or exercise much because of her knee pain. She tests her morning fasting blood sugar about three times a week and states her numbers are "OK," but are rarely below 120. They usually range between 140 and 200. The pharmacist collected her current lab results from the family practice clinic. She states she visits the eye doctor and dentist yearly and has regular foot exams.

KNEE PAIN

KD was diagnosed with moderate osteoarthritis in both knees 2 years ago and reports using a variety of treatments that have mostly failed. KD is currently taking ibuprofen 600 mg TID as needed for knee pain, and is having difficulty using stairs due to extreme pain, pain score of 8/10 when doing stairs. KD notes she has 7 steps to climb to enter her home. Pain with general walking is about a 4/10, which is manageable for her.

Chief Complaint: KD is complaining of shortness of breath (SOB) with moderate exertion, somewhat limiting her physical activities.

Problem List/Conditions

1. Congestive heart failure, systolic dysfunction (NYHA Class 2)
2. Hypertension
3. Diabetes mellitus, type 2
4. Pain, osteoarthritis of knees

Medications

1. Enalapril 10mg po daily
2. Hydrochlorothiazide 25mg po daily
3. Aspirin 81mg po daily
4. Metformin 500mg po twice daily
5. Ibuprofen 600mg po three times daily as needed for knee pain

Vitals/Labs

- BP = 132/78 (140/80 at recent MD visit)
- HR/Pulse = 82 (84 at recent MD visit)
- Weight = 78 kg
- HgbA1c = 8.1 %
- Glucose (finger stick) = 145
- Serum Creatinine = 0.8
- eGFR = 65
- Mild pedal edema (+1) upon examination

SNOMED CT CONCEPT	CATEGORY	SNOMED CT ID
Gathering of current medication list	Procedure	451581000124104
Documentation of current medications	Procedure	428191000124101
Medication reconciliation	Procedure	430193006
Monitoring physiological parameters	Procedure	370836008
Monitoring of laboratory results	Procedure	431561000124105
History and physical examination, limited	Procedure	67879005
Heart failure	Finding	84114007
Hypertension	Finding	38341003
Diabetes mellitus, type 2	Finding	44054006
Pain, knee	Finding	30989003
Shortness of breath (dyspnea)	Finding	267036007
Activity somewhat limited	Finding	445191000124107
Pain onset during exertion	Finding	429056000
Enalapril 10mg daily	Medication	
Hydrochlorothiazide 25mg daily	Medication	
Aspirin 81mg daily	Medication	
Metformin 500mg 2 times daily	Medication	
Ibuprofen 600mg 3 times daily as needed	Medication	

Assess

The pharmacist reviewed KD's information to determine if any medication therapy problems were present.

HEART FAILURE/HYPERTENSION

KD is symptomatic with her heart failure and needs further education in self-management of her condition. KD's ACE-inhibitor dose is too low and not at recommended target goal (enalapril 20mg BID). Patient is also not on a beta-blocker. Need to initiate beta-blocker (BB) and titrate target dose for optimal treatment outcome. Use of hydrochlorothiazide may not be necessary to manage blood pressure or heart failure symptoms. Consider discontinuation once ACEI and BB are titrated to target dosing.

Medication Therapy Problems

1. Needs additional therapy – carvedilol; not on beta-blocker.
2. Dose too low – enalapril; patient is not at recommended target dose of ACEI.
3. Unnecessary therapy – hydrochlorothiazide; may no longer need HCTZ with optimization of heart failure medications.

DIABETES

KD's most recent A1c was 8.1 %, and her self-management strategy is not optimal. She needs further education in self-management of her condition. Her metformin needs to be increased to a target dose of 1000 mg twice daily. She needs further motivation to adopt the needed diet and exercise changes to manage her diabetes.

Medication Therapy Problems

1. Dose too low – metformin; optimal dose is 1000 mg twice daily

KNEE PAIN

KD's pain level is interfering with her ability to climb stairs. Her ibuprofen is not effectively managing her pain and may interfere with heart failure treatment.

Medication Therapy Problems

1. Unsafe medication – ibuprofen; NSAIDs are not recommended in heart failure.

SNOMED CT CONCEPT	CATEGORY	SNOMED CT ID
Medication Therapy Problems		
Heart Failure/Hypertension	Finding	84114007/38341003
Additional medication therapy required - Medication: carvedilol 3.125mg BID	Finding	428981000124101
Medication dose too low - Medication: enalapril 10mg daily	Finding	448152000
Medication therapy unnecessary - Medication: hydrochlorothiazide 25mg daily	Finding	429621000124102
Diabetes	Finding	44054006
Medication dose too low - Medication: metformin 500mg BID	Finding	448152000
Knee Pain	Finding	30989003
Medication unsafe - Medication: ibuprofen 600mg TID PRN	Finding	Pending

Plan

The pharmacist worked with KD to establish goals and interventions for her current conditions.

HEART FAILURE/HYPERTENSION

Goals

1. KD would like to be able to go grocery shopping without getting short of breath.

[Disease-State Outcome – Patient Specific]

2. KD will weigh herself every day and document it in the log book; if weight increases by 5 pounds, she will call the pharmacist.

[Disease-State Outcome – Patient Specific]

3. KD would like to maintain blood pressure at less than 130/90.

[Disease-State Outcome – Condition Specific]

4. KD will be adequately managed outpatient without hospitalization during the next calendar year.

[Economic Outcome]

Interventions

1. Add new medication – carvedilol; start 3.125 mg twice daily for two weeks with plans to increase to target dose of 25mg twice daily

2. Increase dose – enalapril; once carvedilol dose is stabilized, increase enalapril to 10mg twice daily with plan to increase to 20 mg twice daily within two months

3. Education – advise patient on rationale for ACEI and beta-blocker therapy in heart failure

DIABETES

Goals

1. KD will have an improved understanding of managing her diabetes, especially her diet

[Disease-State Outcome – Patient Specific]

2. KD will have her HgA1c less than 7%

[Disease-State Outcome – Patient Specific]

3. KD will test her fasting blood sugars three times a week and document them along with her weight in her log book

[Disease-State Outcome – Patient Specific]

Interventions

1. Increase dose – increased metformin to 1000 mg twice daily with taper up over a week

2. Education – educated on potential nausea and diarrhea from increased metformin dose

3. Referral – referred to dietician for management of diet

4. Education – educated on importance of exercise in conjunction with medication therapy plan

KNEE PAIN

Goals

1. KD would like her pain level when doing steps to be at a 4/10 or less.

[Disease-State Outcome – Patient Specific]

Interventions

1. Discontinue medication – ibuprofen is not recommended in heart failure

2. Education – advise patient to avoid medications like ibuprofen

3. Start new medication – acetaminophen 1000mg up to three times daily as needed for knee pain

4. Start low impact activity and gradually increase activity to reduce knee pain

Updated Current Medication List

- Carvedilol: 3.125 mg twice daily for two weeks, then increase to 6.25 mg twice daily (with a

target dose goal of 25 mg twice daily within two months)

- Enalapril 10mg po daily – dose to be increased once carvedilol dose stabilized
- Hydrochlorothiazide 25mg po daily
- Aspirin 81mg po daily
- Metformin 1000mg po twice daily
- Acetaminophen 1000 mg three times daily as needed for knee pain

SNOMED CT CONCEPT	CATEGORY	SNOMED CT ID
Heart Failure/Hypertension	Finding	84114007/38341003
Goals		
Go grocery shopping without getting short of breath	Narrative	
Record weight each day	Narrative	
Maintain blood pressure less than 130/90	Narrative	
No hospitalizations	Narrative	
Interventions		
Medication commenced - Medication: carvedilol 3.125mg BID	Situation	266709005
Medication dose increased - Medication: enalapril 10mg BID	Situation	432761000124108
Medication efficacy education	Procedure	223418001
Diabetes	Finding	44054006
Goals		
Improve self-management of diet and exercise	Narrative	
HgA1c <7%	Narrative	
Test fasting blood sugar three times a week	Narrative	
Interventions		
Medication dose increased - Medication: metformin 1000mg BID	Situation	432761000124108
Medication side effect education	Procedure	396080005
Referral to dietician	Procedure	103699006
Exercise education	Procedure	304507003
Knee Pain	Finding	30989003
Goals		
Pain level when doing steps to be 4/10 or less	Narrative	
Interventions		
Medication discontinued - Medication: ibuprofen 600mg TID PRN	Situation	274512008
Medication interaction education	Procedure	698603008
Medication commenced - Medication: acetaminophen 1000mg TID PRN	Situation	266709005
Recommendation to exercise	Procedure	281090004

Implement

The pharmacist implemented the interventions outlined in the plan and provided the patient-specific care plan for heart failure, hypertension, diabetes, and knee pain to patient, primary care provider, and pharmacy. The table below reflects the interventions that were implemented at this visit.

SNOMED CT CONCEPT	CATEGORY	SNOMED CT ID
Medication care plan sent to patient	Situation	451561000124109
Medication care plan sent to pharmacist	Situation	451551000124107
Medication care plan sent to primary care provider	Situation	451521000124103
Medication commenced - Medication: carvedilol 3.125mg BID - Status: Performed	Situation Qualifier	432761000124108 398166005
Medication dose increased - Medication: enalapril 10mg BID - Status: Performed	Situation Qualifier	432761000124108 398166005
Medication efficacy education - Status: Performed	Procedure Qualifier	223418001 398166005
Medication dose increased - Medication: metformin 1000mg BID - Status: Performed	Situation	432761000124108 398166005
Medication side effect education - Status: Performed	Procedure Qualifier	396080005 398166005
Referral to dietician - Status: Performed	Procedure Qualifier	103699006 398166005
Exercise education - Status: Performed	Procedure Qualifier	304507003 398166005
Medication discontinued - Medication: ibuprofen 600mg TID PRN - Status: Performed	Situation Qualifier	274512008 398166005
Medication interaction education - Status: Performed	Procedure Qualifier	698603008 398166005
Medication commenced - Medication: acetaminophen 1000mg TID PRN - Status: Performed	Situation Qualifier	266709005 398166005

SNOMED CT CONCEPT	CATEGORY	SNOMED CT ID
Recommendation to exercise - Status: Performed	Procedure Qualifier	281090004 398166005

Follow-up: Monitor & Evaluate

Patient to return to pharmacy in 30 days for follow-up appointment.

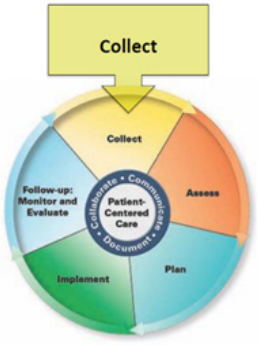
Follow-Up Visit (30 Days Later)

Background

KD returns in 30 days for her follow up appointment with the pharmacist at ABC Pharmacy. She was taken to the emergency room one week prior for a heart failure exacerbation.

SNOMED CT CONCEPT	CATEGORY	SNOMED CT ID
Follow-up visit	Procedure	185389009
Transition of care	Finding	1861000124105

Collect



The pharmacist reviewed the notes from the emergency department visit, updated the electronic

medication list, completed a medication reconciliation and, subsequently, a comprehensive medication review, and performed a brief history and physical.

HEART FAILURE/HYPERTENSION

KD reports she had an emergency department visit two weeks prior. She was out-of-town visiting relatives and ran out of her enalapril and hydrochlorothiazide. She did not take these medications for five then noticed more difficulty breathing on even mild exertion. She was given a temporary supply of the missing drugs and a three-day course of a strong water pill that started with an "f" to help clear her lungs. She completed this course, resumed medications, and noted improvement in symptoms with no recurrence. She started the new carvedilol therapy as prescribed and has taken it as directed for the past month.

DIABETES

KD reports she increased her metformin without any problems. She remembered her diabetes medications and supplies and did not miss taking the metformin. Her fasting blood sugar values have improved and range from 115-130. She has not met with the dietitian; the appointment is scheduled for next week.

KNEE PAIN

KD reports she stopped taking ibuprofen (and related medications) and is now taking acetaminophen 1000 mg TID every day. She knows she can take it up the four times a day if needed. Her pain level on general walking is about a 2/10, and while doing steps, it is a 4/10. She hired a trainer to help with her a light exercise routine.

Chief Complaint: KD's chief complaint is still shortness of breath with moderate exertion; however, she notes some improvement over the past two weeks.

Problem List/Conditions

1. Congestive heart failure, systolic dysfunction (NYHA Class 2)
2. Hypertension
3. Diabetes mellitus, type 2
4. Pain, osteoarthritis of knees

Current Medications

1. Enalapril 10 mg po BID
2. Carvedilol 6.25 mg po twice daily
3. Hydrochlorothiazide 25 mg po daily
4. Aspirin 81 mg po daily
5. Metformin 1000 mg po twice daily
6. Acetaminophen 1000 mg three times daily as needed

Vitals/Labs

- BP = 128/75
- HR/Pulse = 75
- Weight = 79kg

- Finger-stick Glucose = 130
- Hemoglobin A1c = 8.1%
- Mild pedal edema (1+)

SNOMED CT CONCEPT	CATEGORY	SNOMED CT ID
Documentation of current medications	Procedure	428191000124101
Medication reconciliation	Procedure	430193006
Comprehensive medication review	Procedure	428911000124108
History and physical examination, limited	Procedure	67879005
Monitoring physiological parameters	Procedure	370836008
Monitoring of laboratory results	Procedure	431561000124105
Heart failure	Finding	84114007
Hypertension	Finding	38341003
Diabetes mellitus, type 2	Finding	44054006
Pain, knee	Finding	30989003
Shortness of breath (dyspnea)	Finding	267036007
Activity somewhat limited	Finding	445191000124107
Pain onset during exertion	Finding	429056000
Enalapril 10mg twice daily	Medication	
Carvedilol 6.25mg twice daily	Medication	
Hydrochlorothiazide 25mg daily	Medication	
Aspirin 81mg daily	Medication	
Metformin 1000mg twice daily	Medication	
Acetaminophen 1000mg three times daily as needed	Medication	

Assess

KD is still having exertional SOB and mild pedal edema. The medication non-adherence episode is notable but was quickly stabilized with furosemide. KD tolerated the addition of carvedilol without issue but is not at her target dose. Enalapril is also still not at her target dose. The medication thera-

py problems determined at the initial visit were reassessed to determine if they have been resolved and if any new medication therapy problems have developed since the initial visit. The goals of therapy are reviewed to determine if KD is meeting her predetermined goals.

HEART FAILURE/HYPERTENSION

Goal Status

1. KD would like to be able to go grocery shopping without getting short of breath (not achieved).
2. KD will weigh herself every day and document it the log book; if weight increases by 5 pounds, she will call the pharmacist (achieved).
3. KD would like to maintain blood pressure at less than 130/90 (achieved).
4. KD would like to be adequately managed outpatient without hospitalization during the next calendar year (not achieved).

Medication Therapy Problems

1. Needs additional therapy – carvedilol; not on beta-blocker (resolved).
2. Dose too low – enalapril; patient is not at recommended target dose of ACEI (active).
3. Unnecessary therapy – hydrochlorothiazide; may no longer need HCTZ with optimization of heart failure medications (active).
4. Dose too low – carvedilol; not at recommended target dose of beta-blocker (new, active).

DIABETES

Goal Status

1. KD will have an improved understanding of managing her diabetes, especially her diet (not achieved).
2. KD will have her HgA1c less than 7% (not achieved).
3. KD will test her fasting blood sugars three times a week and document them along with her weight in her log book (achieved).

Medication Therapy Problems

1. Dose too low – metformin; optimal dose is 1000mg twice daily (resolved).

KNEE PAIN

Goal Status

1. KD would like her pain level when doing steps to be at a 4/10 or less (achieved).

Medication Therapy Problems

1. Unsafe medication – ibuprofen; NSAIDs are not recommended in heart failure (resolved).

SNOMED CT CONCEPT	CATEGORY	SNOMED CT ID
Heart Failure/Hypertension	Finding	84114007/38341003
Goals		
Go grocery shopping without getting short of breath - Status: Goal not achieved	Narrative Qualifier	 390801001
Record weight each day - Status: Goal achieved	Narrative Qualifier	 390802008
Maintain blood pressure less than 130/90 - Status: Goal achieved	N/A	 390802008
No hospitalizations over calendar year - Status: Goal not achieved	Narrative Qualifier	 390801001
Medication Therapy Problems		
Additional medication therapy required - Medication: carvedilol 3.125mg BID - Status: Resolved	Finding Qualifier	428981000124101 Pending
Medication dose too low - Medication: enalapril 10mg BID - Status: Active	Finding Qualifier	448152000 Pending
Medication therapy unnecessary - Medication: hydrochlorothiazide 25mg daily - Status: Active	Finding Qualifier	429621000124102 55561003
Medication dose too low - Medication: carvedilol 3.125mg BID - Status: Active	Finding Qualifier	448152000 55561003
Diabetes	Finding	44054006
Goals		
Improve self-management of diet and exercise - Status: Goal not achieved	Narrative Qualifier	 390801001
HgA1c <7% - Status: Goal not achieved	Narrative Qualifier	 390801001
Test fasting blood sugar three times a week - Status: Goal achieved	Narrative Qualifier	 390802008
Medication Therapy Problems		
Medication dose too low - Medication: metformin 500mg BID - Status: Resolved	Finding Qualifier	448152000 Pending
Knee Pain		
Goals		
Pain level when doing steps to be 4/10 or less - Status: Goal achieved	Narrative Qualifier	 390802008
Medication Therapy Problems		
Medication unsafe - Medication: ibuprofen 600mg TID PRN - Status: Resolved	Finding Qualifier	Pending Pending

Plan

HEART FAILURE/HYPERTENSION

Goals

1. KD would like to be able to go grocery shopping without getting short of breath [not achieved].

2. KD will weigh herself every day and document it in the log book; if weight increases by 5 pounds, she will call the pharmacist [achieved].

3. KD would like to maintain blood pressure at less than 130/90 [achieved].

4. KD will be adequately managed outpatient without hospitalization during the next calendar year [not achieved].

Interventions

1. Add new medication – carvedilol; start 3.125 mg twice daily for two weeks with plans to increase to target dose of 25mg twice daily [performed].

2. Increase dose – enalapril; once carvedilol dose is stabilized, increase enalapril to 10mg twice daily with plan to increase to 20 mg twice daily within two months [performed].

3. Education – advise patient on rationale for ACEI and beta-blocker therapy in heart failure [performed].

4. Increase dose – enalapril 20mg twice daily [new].

5. Increase dose – carvedilol to 12.5 mg twice daily, start two weeks after enalapril dose increase if patient reports blood pressure and heart rate within normal limits and no dizziness or orthostatic symptoms [new].

6. Monitor laboratory values – check SCr and BUN in four weeks [new].

7. Education – advise patient on rationale for ACEI and BB therapy in HF [new].

8. Education – hypotension, orthostatic issues, and temporary impact of dosing increase [new].

DIABETES

Goals

1. KD will have an improved understanding of managing her diabetes, especially her diet [not achieved].
2. KD will have her HgA1c less than 7% [not achieved].
3. KD will test her fasting blood sugars three times a week and document them along with her weight in her log book [achieved].

Interventions

1. Increase dose – increased metformin to 1000 mg twice daily with taper up over a week [performed].
2. Education – educated on potential nausea and diarrhea from increased metformin dose [performed].
3. Referral – referred to dietician for management of diet [performed].
4. Education – educated on importance of exercise in conjunction with medication therapy plan [performed].
5. Monitoring laboratory values – check HgA1c in 4 weeks [new].
6. Education – follow-up on diet instructions post dietician visit over the phone [new].

KNEE PAIN

Goals

1. KD would like her pain level when doing steps to be at a 4/10 or less [achieved].

Interventions

1. Discontinue medication – ibuprofen is not recommended in heart failure [performed].
2. Education – advise patient to avoid medications like ibuprofen [performed].
3. Start new medication – acetaminophen 1000mg up to three times daily as needed for knee pain [performed].
4. Start low impact activity and gradually increase activity to reduce knee pain [performed].

Updated Current Medication List

- Carvedilol 12.5 mg BID
- Enalapril 20mg po BID
- Hydrochlorothiazide 25mg po daily
- Aspirin 81mg po daily
- Metformin 1000mg po BID
- Acetaminophen 1000 mg TID PRN knee pain

SNOMED CT CONCEPT	CATEGORY	SNOMED CT ID
Heart Failure/Hypertension	Finding	84114007/38341003
Goals		
Go grocery shopping without getting short of breath - Status: Goal not achieved	Narrative Qualifier	390801001
Record weight each day - Status: Goal achieved	Narrative Qualifier	390802008
Maintain blood pressure less than 130/90 - Status: Goal achieved	Narrative Qualifier	390802008
No hospitalizations - Status: Goal not achieved	Narrative Qualifier	390801001
Interventions		
Medication dose increased - Medication: enalapril 20mg BID	Situation	432761000124108
Medication dose increased - Medication: carvedilol 12.5 mg BID	Situation	432761000124108
Renal function monitoring	Procedure	182809008
Medication efficacy education	Procedure	223418001
Hypertension education	Procedure	39155009
Diabetes	Finding	44054006
Goals		
Improve self-management of diet and exercise - Status: Goal not achieved	Narrative Qualifier	390801001
HgA1c <7% - Status: Goal not achieved	Narrative Qualifier	390801001
Test fasting blood sugar three times a week - Status: Goal achieved	Narrative Qualifer	390802008
Interventions		
Blood glucose monitoring	Procedure	698472009
Diet education	Procedure	11816003
Knee Pain	Finding	30989003
Goals		
Pain level when doing steps to be 4/10 or less - Status: Goal achieved	Narrative Qualifier	390802008

Implement

The pharmacist implemented the interventions outlined in the plan and provided the patient-specific care plan for heart failure, hypertension, diabetes, and knee pain to patient, primary care provider, and dispensing pharmacy. The table below reflects the interventions that were implemented at this visit.

SNOMED CT CONCEPT	CATEGORY	SNOMED CT ID
Medication care plan sent to patient	Situation	451561000124109
Medication care plan sent to dispensing pharmacist	Situation	451551000124107
Medication care plan sent to primary care provider	Situation	451521000124103
Medication dose increased - Medication: enalapril 20mg BID - Status: Performed	Situation Qualifier	432761000124108 398166005
Medication dose increased - Medication: carvedilol 12.5 mg BID - Status: In-progress	Situation Qualifier	432761000124108 385651009
Renal function monitoring - Status: In-progress	Procedure Qualifier	182809008 385651009
Medication efficacy education - Status: Performed	Procedure Qualifier	223418001 398166005
Medication efficacy education - Status: Performed	Procedure Qualifier	223418001 398166005
Hypertension education - Status: Performed	Procedure Qualifier	39155009 398166005
Blood glucose monitoring - Status: In-progress	Procedure Qualifier	698472009 385651009
Diet education - Status: In-progress	Procedure Qualifier	11816003 385651009

Follow-up: Monitor & Evaluate

KD is to return to MTM clinic in 30 days and report back via telephone/email if unusual signs or symptoms occur.

OUTCOMES

The previous case example demonstrates the approach and process the pharmacist must undertake to optimize the use of SNOMED-CT in documenting patient care. Once this data is included in the electronic health record or other documentation system, that information can then be searched, sorted, collected, and extracted for a variety of purposes, including internal analytics and perhaps, most notably, to support data submission to payers or other organizations that seek to determine the quality of care provided to the patient.

Outcomes can be measured at an individual patient level or across populations. The case example below shows different ways to report and measure outcomes, determining the quality of care provided for the patient.

INTERVENTIONS PERFORMED
78% (14/18)
Commentary: 18 medication therapy interventions were initiated, and 14 have been implemented (e.g., completed), four are in-progress.
Denominator: Any documented medication therapy intervention code within the last 12 months. Numerator: Medication therapy intervention codes with a status of "Performed – 398166005." Exclusion: Medication therapy intervention codes with a status of "In progress – 385651009."

MEDICATION THERAPY PROBLEM RESOLUTIONS
50% (3/6)
Commentary: Six medication therapy problems were identified and 3 were resolved.
Denominator: Any documented medication therapy problem code within the last 12 months. Numerator: Medication therapy problem codes with a status of "Resolved – code pending."

GOALS ACHIEVED
50% (4/8)
Commentary: Six medication therapy problems were identified and 3 were resolved.
Denominator: Any documented medication therapy problem code within the last 12 months. Numerator: Medication therapy problem codes with a status of "Resolved – code pending."

MEDICATION RECONCILIATION
MEETS
Commentary: Six medication therapy problems were identified and 3 were resolved.
Denominator: Any documented medication therapy problem code within the last 12 months. Numerator: Medication therapy problem codes with a status of "Resolved – code pending."

Table Y shows population level quality measures that could be impacted by pharmacist-provided care based on the previous case example. The patient in the case example would be one of many patients included in the calculation of the numerator and denominator for each of these measures.

Depending on the quality of care provided across the population being measured, the organization or provider group assessed by these quality measures may have positive or negative reimbursement. This is typically determined by the performance on the quality measure compared to an established benchmark or competing organizations.

Table Y: Example Quality Measures Impacted by Pharmacist in Case Example

INDICATORS (METRICS, MEASURES)	GOAL OR OUTCOME DESIRED	QUALITY PROGRAM	DATA SOURCE
Hypertension Management	BP < 140/90	HEDIS CMS PQRS/MA-CRA CMS Star Ratings	Provider EHR Vitals Data
Diabetes Management	HbA1c < 8.0	HEDIS	Provider EHR Lab Data
Heart Failure Management	ACE-I or ARB (Treatment for LVSD)	CMS PQRS/MA-CRA	Provider EHR Medication Data
Medication Adherence: Diabetes	>80% Portion of Days Covered (PDC) for specified diabetes medications	CMS Star Ratings PQA	Part D Prescription Claims
Medication Adherence: hypertension	>80% PDC for specified hypertension medications	CMS Star Ratings PQA	Part D Prescription Claims

INDICATORS (METRICS, MEASURES)	GOAL OR OUTCOME DESIRED	QUALITY PROGRAM	DATA SOURCE
Comprehensive Medication Review	CMR Completion •New to health plan •Within 30 days post-acute care transition	CMS Star Ratings PQA	Part D Plan Reporting
Hospital Readmissions	Hospital readmission within 30 days of hospitalization for HF	CMS HRRP CMS MSSP	Hospital EHR Encounter Data
Patient Satisfaction	Consumer Assessment of Healthcare Providers and Systems (CAHPS)	CMS Core Measures	Hospital Survey Data
Patient Engagement	Shared Decision Making	HEDIS	

5. DISCUSSION

5.1 SEMI-STRUCTURED DATA

There are several ways standardized codes can be leveraged to capture outcomes data. Outcomes can be captured as a single code that describe several different pieces of information. Here are examples of a few codes related to diabetes.

DIABETES OUTCOMES	SNOMED CT ID
Diabetes Resolved	315051004
Diabetes Poor Control	268519009
Diabetes Type 2, in Remission	703138006
Diabetes Type 2, Uncontrolled	443694000
Diabetes Type 2, Well Controlled	444110003
Hemoglobin A1c above reference range	444751005
Hemoglobin A1c < 7%, good diabetic control	165679005
Hemoglobin A1c 7-10%, borderline diabetic control	165680008

5.2 FULLY STRUCTURED DATA

An alternative option is to use multiple codes structured using an established data model that, when referenced appropriately, captures the appropriate information. In the example below, diabetes has a unique SNOMED CT ID that establishes which condition is being addressed. A goal of hemoglobin A1c less than 7% is established. Using the data model, this goal can reference diabetes as the associated disease state which ties the data together. In addition, a status code can be tied to the A1c goal. This piece of data shows whether the associated A1c goal, referenced through the data model, is "achieved" or "not achieved."

SNOMED CT CONCEPT	SEMANTIC TYPE	SNOMED CT ID
Diabetes	Finding	44054006
Goal: HgA1c <7% - Status: Goal not achieved	Narrative Qualifier	 390801001

The provider uses this information to manage the patient toward achieving the established goal. Additional data, such as findings (e.g., risk factors) and procedures (e.g., interventions, education), will be documented as actions are taken. Statuses may also be assigned to these actions to appropriately describe whether they are "in-progress" or "implemented." This data will also reference the condition and goal above to maintain the appropriate relationships within the data structure.

Diabetes	Finding	44054006
Goals		
Goal: HgA1c <7% - Status: Goal not achieved	Narrative Qualifier	 390801001
Interventions		
Medication dose increased - Medication: metformin 1000mg BID - Status: Performed	Situation Qualifier	432761000124108 398166005
Medication side effect education - Status: Performed	Procedure Qualifier	396080005 398166005

If all goes according to plan, the patient will eventually achieve the goal of a hemoglobin A1c below 7%. Once this occurs, the status of the goal can be modified from "goal not achieved" to "goal achieved." Additional goals can be established, or this goal can continue as an active goal in the care plan, ensuring the patient maintains an A1c below 7%.

5.3 MEASURING OUTCOMES

As mentioned previously, outcomes may be measured in various ways. A measure typically consists of a numerator and a denominator. A denominator is a total sample of all instances that meet inclusion criteria (e.g., patients over the age of 18 with a diagnosis of diabetes mellitus, type 2). The numerator is the total number of instances in which a particular type of requirement is met for the population (e.g., hemoglobin A1c below 7% within the last three months of the measurement period).

Everything depends on the type of data used to calculate the measurement. A process measure may be the number of medication therapy problems that have been identified and resolved. This measure is calculated by counting each SNOMED CT code considered to identify a medication therapy problem in the denominator. Medication therapy problems that have an associated status of "resolved" are counted in the numerator. The result is a percentage of resolved medication therapy problems.

An additional feature might include ensuring necessary services occur at scheduled intervals. For example, medication reconciliation could be arranged to occur every three months. In this case, the SNOMED CT code for medication reconciliation can be queried within all eligible patient profiles. If the medication reconciliation SNOMED CT code has been documented with the last three months, then the patient meets the quality measure for medication reconciliation. This measure can be applied across populations to determine how well an organization, a network of providers, or a payer is performing on specific quality measures.

6. SUMMARY

The goal of an outcomes-based healthcare system is to optimize care and overall patient health. In order to accomplish this, there must be a well-outlined method for measuring quality through detailed documentation using structured data. SNOMED CT and other standardized terminologies allow software vendors to implement documentation workflows that capture data, as clinicians manage patients. Technology can support ways to capture data behind the scenes while providers manipulate information within a user interface. This can stimulate changes to current documentation practices producing greater efficiency. Data can be modeled in ways that allow rich information to be captured and reported to measure quality.

Outcomes are directly tied to reimbursement through quality programs. If pharmacists wish to participate in provider-focused quality programs, they must be familiar with the quality measures tied to reimbursement and focus efforts on documenting care appropriately by capturing data used to calculate quality measures. This can be achieved by working with vendors to implement documentation workflows and health care technology standards.

7. REFERENCES

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SNOMED CT is a clinical coding nomenclature available for practitioners to use in documenting patient care. It is the clinical coding standard for the U.S. Government for the electronic exchange of health information and is a required standard in the interoperability specifications defined by the U.S. Healthcare Information Technology Panel. http://www.nlm.nih.gov/research/umls/Snomed/snomed_main.html)

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8. APPENDIX

8.1 PHARMACISTS' PATIENT CARE PROCESS

Figure 1 depicts a proposed, standardized, pharmacist person-centered collaborative care process for pharmacists providing medication therapy management services. The pharmacists' patient care process described in this illustration was developed by examining a number of key source documents on pharmaceutical care and MTM. Patient care process components in each of these resources were catalogued and compared to create the following process that encompasses a contemporary and comprehensive approach to patient-centered care that is delivered in collaboration with other members of the healthcare team.[8]

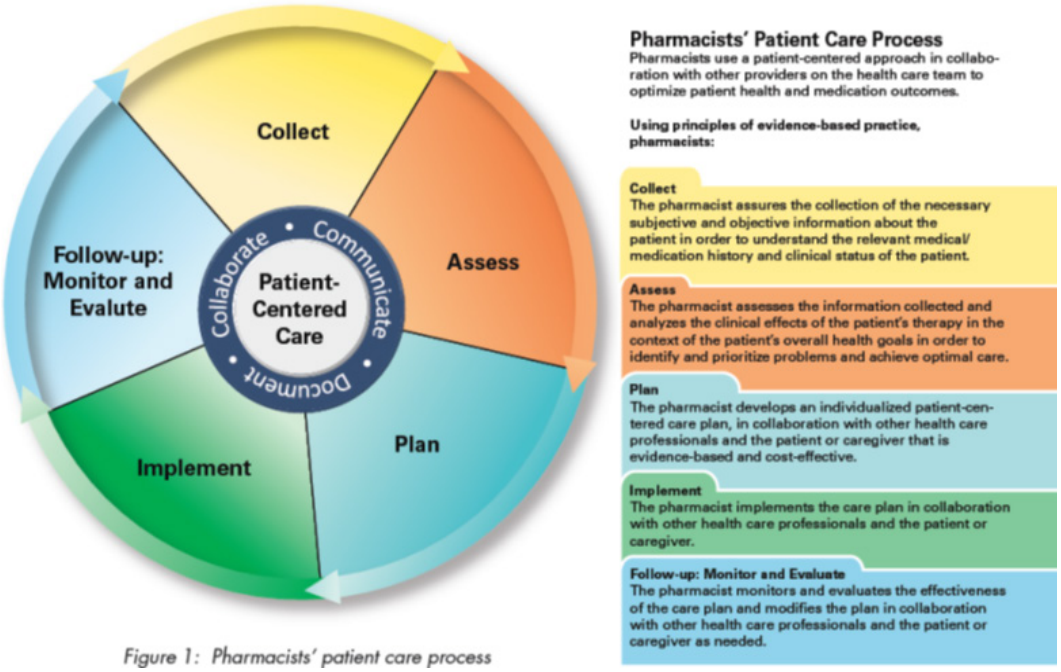

Figure 1: Pharmacists' patient care process

8.2 QUALITY MEASURE EXAMPLES

TABLE 1: Examples of Quality Measures from a Sample of Programs

Quality Measure	Measure Focus/Goal	Measure Type	Quality Program*
Hypertension Management	Measures percentage of patients receiving care with diagnosis of hypertension that have a BP < 140/90	Disease state outcome (surrogate outcome)	HEDIS# CMS MACRA/ MIPS CMS Star Ratings
Diabetes Maagement	Measures percentage of patients receiving care with diagnosis of diabetes that have a HbA1c < 8.0	Disease state out-come (surrogate out-come)	HEDIS#
Heart Failure Management	Measures percentage of patients with a diagnosis of heart failure with left vetricular systolic dysfunction receiving an ACE-I or ARB agent	Disease state outcome (process measure)	CMS MACRA/ MIPS
Medication Adherence: diabetes	Measures the percentage of patients with portion-of-days-covered (PDC) for specified dia-betes medications that are > 80%	Medication-related outcome (surrogate measure)	CMS Star Ratings
Medication Adherence: hypertension	Measures the percentage of patients with portion-of-days-covered (PDC) for specified hy-pertension medications that are > 80%	Medication-related outcome (surrogate measure)	CMS Star Ratings
High Risk Medication use (HRM/DAE)	Measures the percentage of patients > 65 years age receiving “high-risk medications (AKA, "Drugs to be Avoided in the Elderly” or DAE)	Medication-related outcomes (process measure)	CMS MACRA/ MIPS CMS Star Ratings HEDIS#
Preventive Care and Screening: influenza immunization	Measures the percentage of pa-tients aged ≥ 6 months seen for a visit between 10/1 and 3/31 who received an influenza immuniza-tion OR who reported previous receipt of an influenza immuniza-tion	Disease state/preventive measure	CMS Star Ratings

Quality Measure	Measure Focus/Goal	Measure Type	Quality Program*
Comprehensive Medi-cation Review	Measures the percentage of patients with a CMR Completion who are: - New to health plan - Within 30 days post-acute care transition	Medication-related outcomes (process measure)	CMS Star Ratings
Hospital Readmissions	Compares the percentage of patients with a hospital readmission within 30 days of an index hospitaliza-tion for HF with national averages	Disease state outcome, Economic outcome	CMS HRRP CMS MSSP
Patient Satisfaction	Consumer Assessment of Healthcare Providers and Sys-tems (CAHPS): Survey that measures consumers and pa-tients evaluation of their experi-ences with healthcare	Patient-related out-comes	CMS HVBP (uses HCAHPS) CMS MACRA/ MIPS
Patient Engagement	Several measures. An ex-ample is "Shared Decision Making," which measures how often patients are asked to participate in the devel-opment of treatment plans.	Patient-related out-comes	HEDIS

Abbreviations used in Table 1:

- *CMS (Centers for Medicare and Medicaid Services)*
- *MACRA/MIPS (The Medicare Access and CHIP Reauthorization Act of 2015/ Merit-Based Incentive Payment System)*
- *HRRP (Hospital Readmissions Reduction Program)*
- *MSSP (Medicare Shared Savings Plan)*
- *HVBP (Hospital Value-based Purchasing Program)*
- *HEDIS (Healthcare Effectiveness Data and Information Set) is not a quality program but represents a library of quality measures commonly adopted by commercial and managed care plans and providers.*

9. ACKNOWLEDGEMENTS

The following representatives of the Pharmacy HIT Collaborative Work Group, devoted to Professional Service Documentation and Coding, developed this paper.

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